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A STUDY IN VARIATION ON THE WING OF THE HONEY BEE.

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While working on the Honey Bee in the laboratory at the University it was observed that the number of hooks connecting the posterior wing with the anterior was not constant.

The query at once arose as to the amount of variation there might be between different bees in the same hive and also between different hives. Out of this grew a somewhat practical problem as to whether the increase in number of hooks was associated with a decrease in the size of the wing, or whether the increase in number of hooks also implied an increase in size of wing.

The wings of the bee are undoubtedly more efficient for being closely attached to each other. The life of the workers is so short, being only about three weeks, and their activity so great that any increase in efficiency, especially in the organs of flight, must have a very direct influence on the welfare of the whole swarm. So far as the well being of the swarm depends upon nutritive processes the efficiency of the hive is equal to the average efficiency of the workers. Now, if the increase in number of hooks and the consequent, firmer attachment of the wings is compensated for by a smaller wing, there is much less opportunity for the operation of natural selection on the individual bees than if the greater nnmber of hooks is always associated with a broader or longer wing.

This selective process might occur either in the hive or between hives. If it occurs in the hive it would increase the efficiency of the hive somewhat; but if it occurs between hives it finally means the elimination of the weaker hive and the consequent increased efficiency of the species.

In order to find out the real conditions, one of the students, Mr. J. N. Frank, took twenty-five workers from each of four hives and counted the number of hooks on each wing, right and left, and also measured the width of the anterior and posterior wings on each side,

The width only was taken on account of the difficulty in finding a good point at the base of the wing from which to measure the length. The results are so uniform that the width probably gives sufficient data from which to draw conclusions.

Of the four hives studied, numbers one and two were very weak. Number three was a strong hive which made forty (40) pounds of extra honey in the summer of 1900. Number four was weaker than number three and made only ten (10) pounds of extra honey.

The complete measurements are too long to give in detail, and the averages only will be offered here.

AVERAGES OF TWENTY-FIVE MEASUREMENTS FOR EACH HIVE TAKEN WITH AN EYE-PIECE MICROMETER, EXPRESSED IN MM.

HIVE NUMBER ONE.

Average Number of Hooks.		Average Width of Wing.			
Right wing.	Left wing.	Right wing.		Left wing.	
		Ant.	Pos.	Ant.	Pos.
21.3	20.9	4.21	3.61	4.28	3.55

HIVE NUMBER TWO.

Average Number of Hooks.		Average Width of Wing.			
Right wing.	Left wing.	Right wing.		Left wing.	
		Ant.	Pos.	Ant.	Pos.
19.2	18.8	4.14	3.48	4.16	3.48

HIVE NUMBER THREE.

Average Number of Hooks.		Average Width of Wing.			
Right wing.	Left wing.	Right wing.		Left wing.	
		Ant.	Pos.	Ant.	Pos.
21.0	21.0	4.06	3.48	4.07	3.50

HIVE NUMBER FOUR.

Average Number of Hooks.		Average Width of Wing.			
Right wing.	Left wing.	Right wing.		Left wing.	
		Ant.	Pos.	Ant.	Pos.
19.6	19.6	4.09	3.47	4.03	3.41

As to the first query concerning the individual variations in a single hive the complete table shows that No. 1 varies from 18-21 hooks, No. 2 from 17-21, No. 3 from 18-23 and No. 4 from 17-21. The right wing is taken as the standard, and the most active hive, No. 3, shows the greatest individual variation. One bee in this hive had only sixteen hooks, the remaining three being straight spines, showing how the hooks have been modified from ordinary hairs. This

reversion occurred on three separate wings, in No. 2 one hook on each wing being straight.

As to the relation between the number of hooks and the width of the wing the averages are very definite. Taking hives number one and two from the same apiary, it will be seen that the increase in number of hooks goes with the increase in width of wing. The same relation is shown by hives numbers three and four from another apiary in the case of the posterior portion of the right wing and in both anterior and posterior portions of left wing.

The results are not conclusive as to the relative efficiency of different hives because there are so many conditions entering into the production of large quantities of honey. The number of bees, the care during the winter, the age of the queen, the number of swarms produced, and several other factors would have to be taken into consideration.

The differences in the right and left wings in the bees of the same hive is marked. The right wing has the larger number of hooks, but the left wing is the broader. In hive number one the average number of hooks in the right wing is 21.3, left 20.9; but the anterior wing on the right side is 4.21 mm., while the left anterior wing is 4.28; that is, there is a compensation for the reduced number of hooks in the increased width of the wing. This is true of the first three hives. In the fourth hive there is a slight advantage in favor of the right wing.

The following general conclusions may be drawn from these measurements:

(*a*) There is a variation in the number of hooks in a given hive ranging between 17 and 23.

(*b*) The difference in the number of hooks in the right and left wing is compensated for in a given hive by the increased size of the wing. The right and left wings are in physiological equilibrium.

(*c*) In different hives the increase in the number of hooks is accompanied by an increase in width of wing; that is, the variation is emphasized so that selection would work much more effectively; while in the individual, where—if selection operated on account of this variation—it would have to be between different wings of the same bee, the variation is eliminated.